WHO WORKS LONGER – AND WHY? REGIONAL AND INDIVIDUAL CHARACTERISTICS IN THE TIMING OF RETIREMENT

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ABSTRACT

Who works longer – and why? This paper investigates the characteristics of people that stay longer in the workforce, even beyond the time they are eligible to retire. In our regional analysis, we use an 11-year balanced panel of 290 Swedish regions. In the individual analysis, we use a large individual level panel to apply Cox proportional hazard estimates on 'risk' of entering retirement. Our results show a large gender difference: women tend to retire earlier than men. Between employees and entrepreneurs, entrepreneurs retire later. People in larger regions tend to retire later. Higher house prices, and the share of small firms in a region correlate with a lower likelihood of retirement. The local tax rate and the share of blue-collar workers in a region is significantly related to lower retirement age. A high average wage, commuting intensity, and high human capital in a region is associated with later retirement.

Key words: ageing, timing of retirement, regional and individual factors

INTRODUCTION

Due to the ageing population, many countries across the world are struggling with structural problems in their labour markets and public services associated with the ageing of their demographic profile. As many countries, if not all, will experience the consequences of an ageing population to different degrees in the near future. An ageing population and growing demands for healthcare and retirement pensions are fundamental stresses on the economic system in Sweden, as they are in many other developed nations. Two basic population trends put pressure on the system. First, people are living longer, and second, fertility rates are falling in many countries. This means that the active labour force share of the total population declines while the share of retired pensioners rises. Two measures are used more common than others to alleviate the financial pressure on pension systems of most industrial countries. While one is focusing on the pension benefits, the other is focusing on the labour market. Either changes are made to the structure of the pension system itself, or incentives are created to encourage the elderly population to postpone retirement by making work more attractive and/or retirement less attractive. Postponing retirement lessens the outflow of benefit payments, at the same time, it increases the number of people financing the system.

Since the early 1990s, pension system reforms have been put into place in many countries. In 17 OECD countries,[1] such reforms were 'major', defined as a change that influences the entitlements of the standard full career worker, such as pension eligibility age, adjusted retirement incentives, change of years in benefit formula or qualifying conditions, life expectancy and/or financial sustainability, and the defined contribution scheme. In other countries, changes have been less drastic, such as altering pension age for women only or adjusting benefits payable for those retiring early or late (Whitehouse & Quisser 2007).

There is a big body of research that documents the increasing burden on pension systems, health care costs, human capital scarcity and the resulting growth stagnation, age discrimination practices among many other problems (See for example, Graves & Knapp 1988; Bennett 1993; Kallan 1993; Rowles & Watkins 1993; Bloom *et al.* 2010). However, few studies aimed at understanding the characteristics of people who, contrary to the trends, stay longer in the workforce, even beyond the time they are eligible to retire. Even fewer studies have looked at the characteristics of the places where individuals live prior to retirement. In this paper we ask: Who stays longer in the workforce and why? What individual and location characteristics are associated with their decision to keep working and retire later? Answering these questions is vital to coping with the long-term consequences of an ageing population since it allows us to identify the potential factors that policy-makers, business organisations, and other stakeholders need to focus on to diminish the burden of an ageing population on society.

Using simple economic intuition, one would expect that those delaying their retirement are part of a group who do not want to retire for various reasons. This group can be characterised as having high levels of education, work in key positions within their company, have a younger partner or spouse still in the workforce with no plans to retire at the same time, are relatively inelastic in preferring leisure over work, and in general have low incentives to retire. However, there could also be another group who do not retire because they are constrained to stay by financial need. This group might be characterised by workers with low-income levels, a high number of dependents, low savings and high debts, and in general have a deficient economic/financial situation to retire which forces them to remain in the labour force to save enough to retire later (O'Rand *et al.* 1992; Diamond & Köszegi 2003; Mitchell & Utkus 2003; Bidewell *et al.* 2006). In summary, the reasons behind and characteristics of delayed retirees could be vastly different.

In view of this, the goal of this paper is to drill down into the motivations of those who continue to work beyond their normal retirement age. From our study of individuals in the Swedish labour market, we can shed light on specific regional and individual characteristics that influence the timing of retirement. We largely ignore data from the pension system itself, which remained reasonably unchanged during the time-period we study in our analysis. The latest reform was decided by parliament in 1994 and implemented in 1999 (Hagen 2013). We focus on how several regional variables correlate with the average regional retirement age. In a second step, we focus on how individual characteristics correlate with staying on the job longer.

Background – During the 1990s, a debate raged in Sweden concerning the need to increase the age limit for entrance into the old-age pension system. The effective age had been 65, though it was possible to retire earlier but with reduced benefits (Olofsson 2002). The upshot of the debate led to a major reshaping of the Swedish retirement pension system, which was formally initiated in the late 1990s. This made it possible to retire between the ages of 61 and 70. The age and specific timing of an individual's retirement both have a large impact on monthly retirement income. Since the early 2000s, another law makes it possible for an employee to stay on the job until the age of 67. The law says that no agreements can be made that force someone to retire before this age (Olofsson 2002).

The aim of this paper is to model the covariates that help explain the timing of retirement. The Swedish legal reforms, which loosened up the former strict retirement age into a more flexible time interval, allow us to study factors other than the pension system itself that influence the decision to retire. With more freedom of personal choice for everyone, one can study the variations in retirement age to identify patterns that might be positively correlated with working longer or retiring at an early age.

The pension system per se and modifications to it are not our focus. Such modifications have been documented extensively (Gruber & Wise 2002; Whitehouse & Queisser 2007; OECD 2013) and it is well known that they have immediate effects on the decision when to retire.

Analysing a country's or a region's production and sectoral structure is key to understanding how it shapes the labour force and hence how it can influence retirement patterns. There is an extensive literature examining the change from manufacturing to service production and the following rise in demand for altered skill-sets of labour. The spatial distribution of different economic activities, however, has been highly neglected in the related literature on the role of retirement incentives. But even more important, the spatial distribution of economic activity itself has exacerbated the ageing problem through depopulation of rural and/or former manufacturing-dominated areas. The increasing migration of younger workers to urban agglomerations has left small towns and rural areas with a larger share of older population, which gives the ageing problem an important regional character. An ageing population is not only heterogeneously distributed across different sectors of the economy, but it is also spatially uneven. Several studies in regional science already offers evidence for the link between an ageing population and the regional economy (Park & Hewings 2007; Poot 2008; Hewings & Kim 2015; Kim *et al.* 2016).

Considering the abovementioned, we pose two questions, both of which are linked to the timing of retirement:

1. What are the characteristics of the late retirees and how are they distributed across space?
2. Considering the cohort of current potential retirees, which individual and regional variables are relevant, and by how much must they change to significantly raise the probability of later retirement?

To answer these questions, this paper utilises two datasets. The first covers Sweden's 290 regions over 11 years. The second is an individual-level micro dataset covering individuals active in the Swedish labour market at some point during the period 2001–2011. Statistics Sweden track individuals in the labour market in Sweden, which allows for following both individual and spatial characteristics over time.

The following section of this paper present a review of the relevant literature on ageing and retirement. The third section introduces a simple life-cycle model relating optimal retirement age to three of its main determinants: the disutility of work, the wage rate, and wealth. The fourth section introduces the regularities of the Swedish pension system that is used for constructing variables that are used in our analysis. The fifth section presents a regional level analysis for identifying the differences in average retirement age across space. The sixth section presents an individual level analysis of factors influencing the timing of retirement. We finalise the paper with summarising the results from the two analyses.

ECONOMIC EFFECTS OF AGEING

The economic effects of ageing can be viewed from both macroeconomic and microeconomic perspectives. Regarding the macroeconomic perspective, productivity and growth are key areas to examine. This follows from the effects that a demographic shift causes on aggregate savings, investments, capital flows and labour market participation. From the microeconomic perspective, individual income, consumption and personal savings are the issues of main importance.

A strand of literature focuses on the macroeconomic issues, particularly savings and capital accumulation. Cutler *et al.* (1990) argue that, in general, population ageing is not a negative but rather improves future living standards in the US. The best policy response in their argument is somewhat surprising – a reduction in the optimal national saving rate. Ermisch (1995) and Lindh and Malmberg (1999) address the general impact of population ageing on economic growth in Europe and OECD countries. These studies argue that the effects of ageing on productivity, earnings and unemployment are not very large. Even in cases when it has a significant negative impact on either, small policy changes are argued to offset such impacts. However, they argue that since age structure matters for economic growth the framework of the human-capital-augmented Solow model should be amended with data reflecting ageing. This neoclassical growth model with technical adjustments performs well in both pooled and panel estimations. Results show that the age group of 50–64 influence labour productivity positively, while the population above 65 affect it in a negative way (Lindh & Malmberg 1999).

Fougère and Mérette (1999) modify the overlapping generations (OLG) model of Hviding and Mérette (1998) to study the effects of population ageing in seven OECD countries (Canada, France, Italy, Japan, Sweden, UK and US). When endogenous growth effects are integrated in the model, derivations show that ageing may increase incentives for future generations to invest in human capital, which leads to higher growth. Even if national savings may decline, it does not necessarily mean that there will be a real output loss. In an interesting study, van Groezen *et al.* (2005) examine the effects that population ageing has on the production in the economy and economic growth. They propose two mechanisms: (i) as the population becomes older, capital accumulation increases and spurs growth and (ii) as an older population tends to demand more labour-intensive services, productivity growth will decrease with a shift in the demand structure.

What about regional characteristics? Brunow and Hirte (2006) examine whether there is a specific age structure that favours regional growth and whether differences in age structure cause per capita growth differences between regions. The authors use NUTS 2 regions in 15 EU countries and find a correlation between age and productivity, even after controlling for country specific effects. Their results show that the largest growth effects are achieved by the population cohort between 30 and 44 years of age. Poot (2008) reviews the literature on the effect of population ageing on regional competitiveness, with a focus on innovation, entrepreneurship and productivity. Ageing is argued to reduce regional competitiveness.

A large body of literature deals with the role of demographic changes on the housing market, and how demand fluctuations affect house prices and the overall economy (e.g. Mankiw & Weil 1989; Hamilton 1991; Henderschott 1991). While many argue that a decline in housing demand will result from population ageing, some argue that the opposite may be true, that is, that demand for housing is expected to increase as a result of ageing population (Borsch-Supan 1991). The older generation will occupy their home longer, consequently, fewer houses will be transferred to the younger generation, implying an increase in housing demand.

Although older entrepreneurs will become a larger part of the economy as ageing in advanced societies continues, research on elderly entrepreneurship has been limited. Some exceptions exist which drill into the characteristics of the 'grey entrepreneurs' (Curran & Blackburn 2001; Weber & Schaper 2004; Backman & Karlsson 2013) or its relationship to retirement (Kerr & Armstrong-Stassen 2011; Wainwright & Kibler 2013). Issues that need to be further investigated concerning young vs. old entrepreneurs include motivations of elderly entrepreneurs, success rate, financial and knowledge access impact on venturing behaviour, the impact of governmental policies, and the impact of cultural differences.

There are several 'push' factors that compel older people to become entrepreneurs, including difficulties in finding a job at an older age, or unsatisfactory retirement entitlements. However, there are also 'pull' factors that attract older people into entrepreneurship, including an increasing prevalence of 'portfolio careers'. An increasing acceptance of home-based and part-time businesses lowers barriers to entry. Singh and DeNoble (2003) propose three types of 'grey' entrepreneurs: (i) the constrained entrepreneur who has long wanted to start a business but lacked finances or flexibility; (ii) the rational entrepreneur who considers self-employment as a further development of his/her career and (iii) the reluctant entrepreneur who is forced into entrepreneurship due to financial necessity. Gender can also be a factor when analysing older entrepreneurs, given that males dominate business ownership. But there is a lack of literature about the survival rates of firms started by elderly individuals, male or female. Limited literature tends to confirm that these firms survive longer than the ones started by younger individuals (Cressy & Storey 1995).

An inverse U-shaped relationship between age and entrepreneurial activity is addressed by a number of studies (Bönte *et al.* 2009; Backman & Karlsson 2013). Backman and Karlsson (2013) show that the inverted U-shaped curve fits Sweden. Individuals between 55 and 64 have a positive influence on the entrepreneurial activity at both the regional and individual levels. The age effect is found to be particularly strong in rural municipalities.

Another issue raised in the literature relates retirement to location through the migration patterns of individuals. Although individuals are mobile throughout their lives, what they take into consideration when deciding on whether to move or not, or what to take into consideration, drastically changes closer to retirement or post-retirement (Bures 1997). Some of these studies investigate the seasonal effects on the mobility of elderly population and retirees, as a large share of European and American population relocate themselves temporarily over the year, which implies a dual residential arrangement (King *et al.* 1998; Williams *et al.* 2000; Rodriguez 2001; Gustafson 2002). A major issue taken into consideration when analysing the migration behaviour of retirees is the stock of amenities in the destination (Haas & Serow 1993; Carlson *et al.* 1998; Gosnell & Abrams 2011). A large share of retirement migration is related to the climate differences between locations. Yet there are several other amenity related factors that explain the retirees' mobility patterns, ranging from urban consumer amenities to health services, or on the contrary moving towards rurality to avoid the dissamenities associated with the urban life, for example, congestion, crime, traffic (Bennett 1993; Gosnell & Abrams 2009). In any case, mobility of retirees appears to be explained both by push and pull factors in the literature (Longino *et al.* 2002)

A THEORETICAL FRAMEWORK FOR OPTIMAL RETIREMENT AGE

This section is devoted to presenting a straightforward life-cycle model designed to shed light on different factors that influence age at retirement. The aim is to illustrate what may be expected from the relationships between retirement age and some of its determinants. The derivation of the results is closely related to van Ooijen *et al.* (2010). A version of the model set in discrete time is given in Eder (2016).

Consider an individual i that lives for T periods. In every period, t, the level of consumption, c_{it}, is decided. Also, in each period, s/he contemplates whether to retire or not. The decision to retire is dichotomous: either s/he works full time or s/he fully retires from work. The constant wage, y_i, and wealth W is used for consumption. Individuals derive utility from consumption and disutility from working. This disutility is denoted d_i.

The individual maximises the life-time utility function:

$$U_i = \int_0^{R_i} e^{-\lambda t}(u(c_{it}) - d_i)dt + \int_{R_i}^{T} e^{-\lambda t} u(c_{it})dt. \tag{1}$$

Future utility is discounted at the subjective rate of time preference λ. R_i is the individual retirement age. Before retirement the disutility of working must be endured; after retirement, there is no such disutility. Life-time consumption must be paid by wage earnings and pre-retirement wealth. The budget constraint for the individual is:

$$\int_0^{R_i} e^{-rt} y_i dt + e^{-rt} W = \int_0^T e^{-rt} c_{it} dt. \quad (2)$$

The interest rate is denoted by r. The individual's job is to choose consumption and retirement age such that utility is maximised, subject to the constraints that the present value of wages and wealth equal the present value of consumption. Setting up the Lagrangian, L, using the multiplier, μ, gives the following first order conditions:

$$\frac{\partial L}{\partial c} = 0 \rightarrow \mu = \frac{\partial U}{\partial c} \frac{\lambda(1-e^{-rT})}{r(1-e^{-\lambda T})}, \quad (3)$$

$$\frac{\partial L}{\partial R} = 0 \rightarrow \mu = \frac{d}{y} e^{-(r-\lambda)}, \quad (4)$$

$$\frac{\partial L}{\partial \mu} = 0 \rightarrow c(1-e^{-rT}) = rWe^{-rt} + y(1-e^{-rR}). \quad (5)$$

To facilitate a straightforward solution to the problem outlined above, a few simplifications can be made. Assume that the subjective rate of time preference, λ, is equal to the interest rate, r, and that they both are zero. Further assume that the utility function is specified as: $u(c_{it}) = \ln(c_{it})$. Then the first order conditions can be written as follows:

$$\mu = \frac{1}{c}; \ \mu = \frac{d}{y}; \ cT = W + yR. \quad (6)$$

Combining these simplified first order conditions yields:

$$c = \frac{y}{d}, \quad (7)$$

and

$$R = \frac{T}{d} - \frac{W}{y}. \quad (8)$$

These two last expressions give the smoothened consumption and the utility maximising retirement age. Consumption increases with income and decreases with disutility of working. A high disutility of working leads to lower consumption and more saving to enable a lower retirement age. Wealth does not influence consumption directly in this framework. Instead wealth is used to enable earlier retirement.

The optimal retirement age is positively related to longevity, T, and wage, y. The wage can be interpreted as the opportunity cost of retirement. Optimal retirement age is negatively related to the disutility of working, d, and wealth, W. In the empirical analyses, we recall these relationships and the different variables used to proxy them. For the case that they are not directly measurable. Thus, despite its simplicity the above model helps grounding hypotheses from the optimising behaviour of individuals.

THE SWEDISH PENSION SYSTEM AND THE DATA USED TO STUDY RETIREMENT TIMING

In a broad political consensus, the Swedish pension system was reformed in the 1990s. Since this reform, the system has been relatively stable. It has also gone through a 'stress-test' during the financial crisis of 2008. Incorporated into the system is an automatic adjustment to economic fluctuations. The stability of the Swedish pension owes to the fact that it was constructed against a backdrop of the severe Swedish economic crisis of the 1990s (Barr 2013).

The Swedish pension system consists of three parts. Retired individuals typically receive payment from a public pension system, a system based on their occupation and a voluntary system. For this research, we do not need to go into details of the three sources of retirement funding, since what is important here is the decision of when to retire. We focus rather on the choice an individual has when it comes to the timing of retirement. (Hagen 2013)

It is possible to start receiving pension benefits at the age of 61, with lower benefits. Retirement with full benefits is possible at 65 years of age. No one can be 'forced' into retirement before the age of 67. This means basically that there is room for individual flexibility in one's actual retirement over an age span between 61 and 67 years of age (Weaver & Willén 2013). This information about the pension system is used for identifying retirees in the individual level full coverage data-base we use in our empirical analysis.

The data is yearly individual-level data on workers and their characteristics, provided by Statistics Sweden. Although the data available to us dates back to the early 1990s, we have chosen to concentrate our analysis on the period between 2001 and 2011 for several reasons. First, the availability of a specific occupational identification during this period is a crucial variable in considering the timing of retirement across occupations and sectors. For example, we expect that workers associated with manufacturing production sectors are in general more prone to retire early because of the intensiveness of physical tasks in their jobs, while managerial positions would be exempt of such burden and more likely to stay longer in the workforce. Such a hypothesis, however, needs to be proven by the analysis. Second, no major structural change was implemented in the pension system during the period of 2001–2011 (Hagen 2013) that cannot be captured by including year fixed effects.

The full dataset we start off with contains all individuals in the labour force in Sweden during 2001–2011.[2] But since we are only interested in the subsample already retired and potentially retiring during that period, we start the identification of retirees using all workers that in 2001 were 50 years old or older. These individuals are the ones who between 2001 and 2011 would potentially retire. We follow them in the subsequent years and track their status in the workforce, resulting in a panel of retirees and potential retirees for Sweden between 2001 and 2011. However, to keep the potential or probability of retirement constant over the period, each year we add the new cohort of individuals that are 50 years old. Of course, many of these continue to work the whole period.

Once retirees and potential retirees are included in the sample, and since there is no variable confirming if an individual is retired at a time t, we use an empirical algorithm to identify retirees in the data, hence creating a new binary variable that equals 1 if an individual is retired and 0 if he is at risk of retirement (i.e., a potential retiree). The algorithm contains the four steps described below.

1. The algorithm starts at time $t_0 = 2001$ identifying all individuals that at that time were already retired as those that were older than 60 and had no income from a working source (i.e. retired = 1), and then identifying potential retirees in year t_0 (i.e. workers receiving a wage in 2001) as well as in subsequent periods (i.e. retired = 0).
2. Next, a procedure is used asking if in between time t-1 and t a particular individual has suffered a dramatic loss (of 70% or more) in their income. If this is the case, individuals are assumed to retire this year. Instead of assuming that retirees are only those with zero income, we chose to identify retirees as those with a dramatic loss of income since it better reflects the real pattern of partial income loss from year to year. In this context, we surmise that income losses less drastic than 70 per cent could be due to reasons other than retirement, such as illness leading up to long medical leaves, or a job change, etc. Furthermore, it avoids potential problems since most people do not retire on the same date of each calendar year.
3. From those new retirees identified in year t now marked as retired = 1, we end up in year t+1 with a smaller set of potential retirees that go through the routine of step 2 in the subsequent years until we reach the final period $t = 2011$.
4. To keep the dataset simple and avoid duplication, the final set was converted from a panel to a cross-sectional dataset by keeping only the records of an individual when retired plus the records of those individuals who in 2011 have not retired at all. In other words, although the dataset is not a panel, it is the result of following the same labour force through time and recording in each period which individuals retired and which ones did not.

In the end, we obtain a dataset with 4,190,298 unique individuals with their characteristics and their retirement year, plus the subset of workers that remained in the labour force throughout the entire period. The individual level characteristics of each observation are: occupation, family type, gender, age, education, and location.

REGIONAL RETIREMENT AGE ANALYSIS: IN WHICH REGIONS DO PEOPLE STAY LONGER IN THE LABOUR MARKET?

First, we perform a regional level analysis of the average retirement age in Swedish municipalities. We use municipality level data on several available variables that are expected to relate to the average retirement age. Along with the presentation of each variable, we connect back to the theoretical model derived earlier when applicable.

Average retirement age in municipalities is simply calculated as the mean of the individual ages of retirees aggregated based on municipality of residence. The individual level data described above is used and is the dependent variable to be explained. Below we introduce 10 independent variables, give a rationale for their inclusion in the model, and hypothesise on their possible effect.

Population (*Pop*) – The number of people that live in the region. In Sweden, we know that regional size correlates with many economic phenomena that vary across space. Wage rates, for example, follow reasonably closely the regional size distribution. Thus, we hypothesise that size, ergo higher wages in agglomerated areas entails a higher average retirement age.

House price (*HP*) – The average price of sales of single-family houses. House prices vary regionally in concordance with regional attractiveness. High house prices indicate that real or potential wealth is high. For many, the market value of their house represents a very large share of total wealth. Thus, selling the house around the time of retirement for many means that potential affluence can be realised. The hypothesis is that higher house prices are associated with a lower retirement age. If house price is considered a source of wealth the model presented before predicts such a relationship.

Share employed (*Emp*) – Share of the population aged 20 to 60 that have a job. We set the upper age limit to 60 years to not create backward causation. This variable says something about the broad employment opportunities in the region. It can also be expected in a general way to reflect the overall economic conditions in the region. If employment conditions in a region are relatively good, it brings about an upward pressure on wages and better options in general in the labour market. All else equal, this means that employment is more attractive relative to retirement. This leads us to expect a negative relationship towards early retirement.

The share of small firms (*small*) – The number of firms employing between one and four people divided by the total number of firms. The share of small firms is intended to proxy the regional entrepreneurial climate. The aim is to measure the municipality's prevailing view of entrepreneurship. A large share of small firms in a municipality means that the probability is high that the average person has some knowledge and understanding of entrepreneurship, and that entrepreneurial efforts are accepted in the local market. Diffusion of knowledge on entrepreneurship may originate from running one's own firm, being employed in a small firm, or otherwise coming into contact regularly with small business owners. To the extent that entrepreneurs endure a lower level of disutility from work we expect them to retire later.

Local tax rate (*Tax*) – In Sweden, a large part of income taxes is collected at the regional and municipal level. Since regional political majorities decide the rate of this tax, it varies between regions, with an average of a little less than 32 percent. For a relatively large share of the labour force, that is, the relatively low-paid workers, this is the only income tax they pay. All else being equal, a higher tax rate means that employment is less rewarded, which in turn may make retirement comparatively more attractive.

Share of women in workforce (*Women*) – We know that there are differences in the retirement age between the sexes. From the data, we know that women tend to retire earlier. Therefore, we expect the share of females in the labour force to correlate to average retirement age negatively.

Share blue-collar jobs (*Blue*) – The structure of the labour market in terms of types of jobs is likely to influence the average retirement age. To control for this, we include a measure using the share of occupations that are labeled 'machine operators' in all sorts of manufacturing. This variable is expected to have a negative relationship with the average retirement age.

Average wage (*Wage*) – Our theoretical model presents wage as one of the determinants, as we include it in the regional model likewise. The correlation to average retirement age is positive. In the regional model, however the average wage will correlate to a number of the other independent variables.

Intensity of commuting (*Commute*) – To control somewhat for the hierarchical structure of regions we include a variable based on commuting patterns. Intensity of commuting is measured as in-commuting minus out-commuting divided by number of jobs.

Education of workforce (*Edu*) – The education level of the workforce can be expected to be a major determinant of retirement age. Education is measured as the share of the active workforce that holds at least a bachelor's degree. A higher education is associated with higher wages. Also, one may expect that higher education is related to a lower disutility of work. Both these effects relate to a higher retirement age.

Before going to the empirical part of the analysis it is necessary to reflect a bit on regional mobility of retirees, or early retirees. All the variables introduced are measures for the region where individuals live at the time when they retire. We know that some proportion of early retirees change residence. Perhaps they move to their summer-house or move to a warmer climate in Spain. We have no information about such mobility in our dataset, hence it cannot be incorporated into the analysis. Thus, we analyse the importance of the ex-ante location.

Figure 1 shows two maps of Sweden. The map on the left shows the variation in average retirement age across Swedish municipalities. A darker shade indicates a higher average retirement age. The map on the right shows the variation in regional size in terms of total population, with darker areas reflecting higher population. It appears that there is no obvious relationship between the two.

In Table 1, we report descriptive statistics for all variables. Employment, small firms, women, blue-collar, commuting and education are ratios and the tax rate is a percentage. The other variables are in level form and logged in the model. Also, the abbreviations of the variables are available in the table.

Below we present the specification of the empirical model designed to test the relationships. The model is estimated using regional data for the 290 Swedish municipalities. Data is gathered for 10 years, which makes it a balanced panel of a total of 2,900 observations. We use several estimation techniques in order to explore the structure of the phenomena at hand. First, we include a set of non-spatial fixed effects (FE) models without and with time effects as a way to provide information of the data assuming no spatial relations. Then we estimate a set of spatial models to test different spatial characterisations such as: spatial autoregressive (SAR) models with and without time effects and a time lag; spatial autoregressive models with and without time effects; including spatial autoregressive disturbances (SAC); and an spatial Durbin model (SDM). In total eight models are tested. Below is shown a specification for the fixed effects estimation without time effects:

$$\begin{aligned}\ln(RA)_{m,t} = {} & \alpha+\beta_1\ln(pop)_{m,t}+\beta_2\ln(HP)_{m,t}\\ & +\beta_3 emp_{m,t}+\beta_4 small_{m,t}+\beta_5 tax_{m,t}\\ & +\beta_6 women_{m,t}+\beta_7 blue_{m,t}+\beta_8\ln(wage)_{m,t}\\ & +\beta_9 commute_{m,t}+\beta_{10} edu_{m,t}+\alpha_m+\varepsilon_{m,t}.\end{aligned}$$

It is expected that at the regional level the retirement age is influenced by factors that are both idiosyncratic and exterior to a particular region. As such, the retirement age is hypothesised to

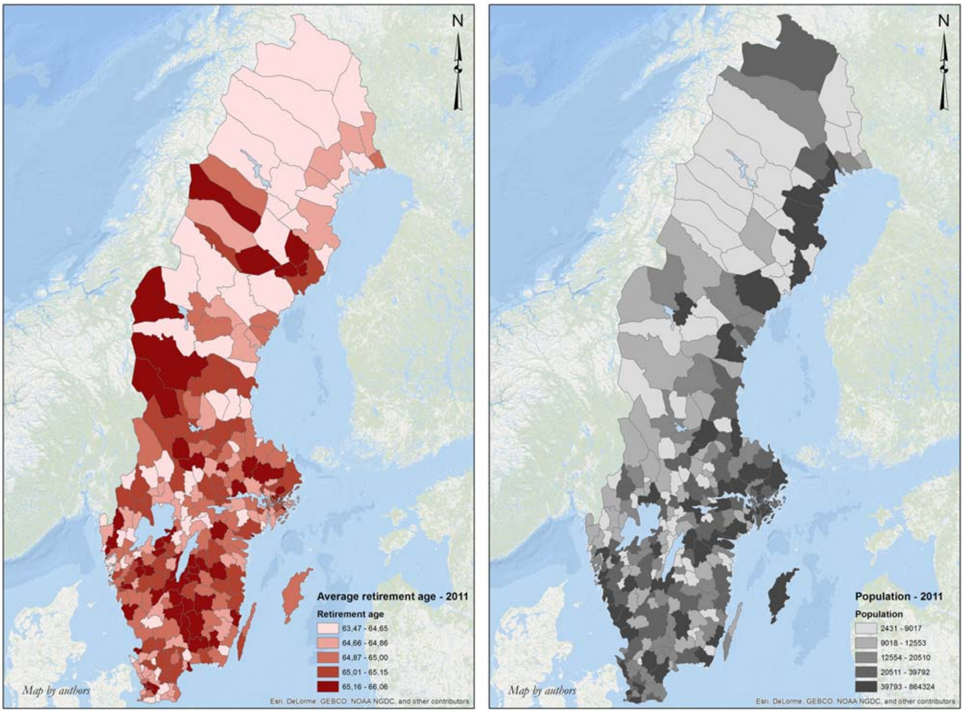


Figure 1. *Average retirement age and population in Swedish regions (2011), map by authors [Colour figure can be viewed at wileyonlinelibrary.com]*

be affected by both the labour market conditions of each region and its neighbours. In this fashion and by the help of the calculation of direct and indirect effects, the SAR and SAC models test a global spillover effect hypothesis, in which is expected that the retirement age of a region *m* is not only affected by its immediate neighbours, but also by the neighbours of its neighbours. This hypothesis could be plausible if there is a high level of economic interdependence among regions that could make that periods of high labour demand in another non-adjacent region would also affect indirectly region *m*. In the SAR and SAC models these direct and indirect effects are mostly driven by the spatial lag, however we also included the SDM as a way to test if the lag of the independent regressors is also important in predicting the retirement age of a region.

The resulting estimates are presented in Table 2. Overall, all eight estimations give somewhat comparable results for a number of variables. However, there are differences too. The first two models show the non-spatial fixed effects (FE) models, including time dummies makes that the significant results of the first model very different compared to the second and the rest. For the spatial models (3–8), the reported rho parameter indicates generally a positive influence between neighbouring regions. However, this does not seem to influence the estimated parameters in any systematic way. The included time lag in the fifth model turns out to be insignificant. Models 3–5 seem to indicate a high and positive spatial correlation that decreases when time dummies are included. However, it is interesting to note that when SAR models are extended to include a spatial structure in the error term yielding the SAC models, the lambda is positive and significant and reduces even more the level of rho. This suggests that there are spatial unobservable effects that are now controlled for. Finally, the direct and indirect effects along with the SDM suggest that the majority of the spatial effect in retirement ages comes from the direct effect and almost none from the indirect sources. In fact, the coefficients of the SDM lag independent variables resulted all non-significant with exemption of wages. Our

Table 1. *Descriptive statistics for regional data.*

Variable	Abbreviation	Min.	Max.	Mean	Std. Dev.
Retirement age	*RA*	63.3	72.9	65.4	0.896
Population	*Pop*	2,431	864,324	31,644	61,553
House price	*HP*	216	7,061	1,204	933
Share employed	*Emp*	0.448	0.732	0.572	0.046
Share small firms	*Small*	0.603	0.904	0.792	0.046
Local tax rate (%)	*Tax*	27.5	34.2	31.9	1.1
Share women in workforce	*Women*	0.428	0.511	0.469	0.014
Share blue-collar jobs	*Blue*	0.001	0.357	0.094	0.063
Average wage	*Wage*	756	3126	1,367	278
Intensity of commuting	*Commute*	−1.85	0.55	−0.19	0.3
Education of workforce	*Edu*	0.033	0.332	0.088	0.042

favourite model is SAC FE model with year dummies (model 7) since it seems to better capture the spatial structure of the data.

Our hypothesised relationships between the dependent variable and the independent variables come out mixed. Regional population size correlates positively to retirement age as expected, which means that in growing regions (in terms of population), people tend to retire later. The logarithmic specification allows us to interpret the estimated coefficient as an elasticity. In a region that grows by one per cent, the average retirement age is expected to increase by 0.0424 per cent. The house price parameter is insignificant. This means that rising housing values is not influencing the retirement age.

Municipalities with increasing employment rates are associated with lower average retirement age. This goes contrary to our hypothesis. Municipalities with a large share of small firms have a lower average retirement age. High and increasing municipal tax-rate lowers the average retirement age. Taxes lower income, so from our model this is a result we should expect. A change in the share of females in the workforce, the share of blue-collar jobs, average wages and the intensity of commuting all come out insignificant. An increase in the average education level of the workforce is negatively related to average retirement age.

In the next section we present the results from the individual level analysis. We investigate determinants for increasing the probability of individuals to stay in the labour force and postpone retirement to a later date. Thus, we look at individual effects while controlling for the regional characteristics.

INDIVIDUAL RETIREMENT ANALYSIS: WHO STAYS LONGER IN THE LABOUR MARKET?

In this part of our analysis, the decision of the timing of retirement is related to individual variables, workplace variables, and variables related to the location of employment. We therefore explore in different ways both individual and interacting effects of these variables in the decision to retire. To do so, we model retirement as 'surviving' in the labour force.

As a starting point, an exploratory analysis to assess the potential variables influencing retirement is here achieved through estimating survival functions for each variable suspected to have an impact on the outcome of study. Initially we must consider a random variable T denoting the time of failure of an event (in the present case, this event is retirement), with density $f(t)$ and distribution function $F(t)$. Kaplan-Meier (1958) proposed a non-parametric estimator of the survival function $S(t)$ (i.e. $S(t) = 1-F(t)$) which is calculated as the probability of survival after time t, where $S(t)$ is given by:

$$\hat{S}(t) = \prod_{j|t_j \leq t} \left(1 - \frac{d_j}{n_j}\right), \quad (1)$$

where j is the jth failure time from $t_1, \ldots, t_k$ total failure times in the data, and at time t_j, n_j and d_j are the number of individuals at risk

Table 2. *Regressions explaining regional variations in average retirement age.*

Dep. Variable: Retirement Age (ln)	Fixed Effects (FE)	Fixed Effects (FE)	Spatial Auto Regressive (SAR) FE	Spatial Auto Regressive (SAR) FE	Dynamic SAR FE	Spatial Auto Regressive with Auto Regressive Disturbances (SAC) FE	Spatial Auto Regressive with Auto Regressive Disturbances (SAC) FE	Spatial Durbin Model (SDM) FE
Direct Effects								
Year effects	No	Yes	No	Yes	No	No	Yes	Yes
Population (ln)	0.0540***	0.0435***	0.0403***	0.0397***	0.0441***	0.0450***	0.0424***	0.0493***
House price (ln)	0.0176***	−0.00318	0.000493	−0.00281	−0.0000947	−0.00228	−0.00263	−0.00213
Share employed	0.120***	−0.0613***	−0.0566***	−0.0589**	−0.0462**	−0.0640***	−0.0610***	−0.0762***
Share small firms	−0.162***	−0.0423***	−0.0352***	−0.0408***	−0.0311**	−0.0436***	−0.0419***	−0.0491***
Local tax rate (%)	−0.00560***	−0.00180***	−0.00138***	−0.00152***	−0.000956	−0.00141***	−0.00149***	−0.00131***
Share women in workforce	−0.154***	−0.027	−0.0668*	−0.0220	−0.0755*	−0.0160	−0.0192	−0.0322
Share blue-collar jobs	0.0431**	0.00776	0.0109	0.00853	−0.000887	0.0106	0.00933	0.00721
Average wage (ln)	0.0299***	−0.000843	0.00171	−0.00108	0.00327	−0.00124	−0.00119	0.000171
Intensity of commuting	−0.00847	0.0035	0.00369	0.00321	0.00425	0.00326	0.00327	0.000586
Education of workforce	−0.404***	−0.0732	−0.0835**	−0.0755	−0.0866**	−0.111**	−0.0908*	−0.114**
Indirect Effects								
Population (ln)			0.816***	0.0431*	0.830***	0.0253	0.0254	0.383
House price (ln)			0.00982	−0.00310	−0.00352	−0.000789	−0.00167	−0.0323
Share employed			−1.165**	−0.0635	−0.888*	−0.0378	−0.0357	−1.137
Share small firms			−0.720**	−0.0433	−0.580*	−0.0259	−0.0242	−1.324
Local tax rate (%)			−0.0276***	−0.00164*	−0.0180	−0.000704	−0.000903	−0.0217
Share women in workforce			−1.340	−0.0257	−1.445	−0.0118	−0.0131	−5.944
Share blue-collar jobs			0.217	0.0103	−0.0281	0.00534	0.00639	−0.730
Average wage (ln)			0.0305	−0.00108	0.0584	−0.00100	−0.000615	0.312
Intensity of commuting			0.0756	0.00350	0.0825	0.00175	0.00204	−0.551
Education of workforce			−1.674*	−0.0859	−1.603**	−0.0674	−0.0575	−2.791

Table 2: *Continued*

Dep. Variable: Retirement Age (ln)	Fixed Effects (FE)	Fixed Effects (FE)	Spatial Auto Regressive (SAR) FE	Spatial Auto Regressive (SAR) FE	Dynamic SAR FE	Spatial Auto Regressive with Auto Regressive Disturbances (SAC) FE	Spatial Auto Regressive with Auto Regressive Disturbances (SAC) FE	Spatial Durbin Model (SDM) FE
Total Effects								
Population (ln)			0.856***	0.0828***	0.874***	0.0703**	0.0679***	0.433
House price (ln)			0.0103	−0.00591	−0.00362	−0.00307	−0.00430	−0.0344
Share employed			−1.222**	−0.122**	−0.934*	−0.102	−0.0967**	−1.213
Share small firms			−0.755**	−0.0841**	−0.611*	−0.0695	−0.0661**	−1.373
Local tax rate (%)			−0.0290***	−0.00316***	−0.0190	−0.00211**	−0.00240**	−0.0230
Share women in workforce			−1.407	−0.0477	−1.521	−0.0278	−0.0323	−5.976
Share blue-collar jobs			0.228	0.0188	−0.0290	0.0159	0.0157	−0.723
Average wage (ln)			0.0322	−0.00215	0.0617	−0.00224	−0.00181	0.312
Intensity of commuting			0.0792	0.00671	0.0867	0.00500	0.00532	−0.550
Education of workforce			−1.758*	−0.161	−1.689**	−0.179	−0.148	−2.905
Lag. Dep.					−0.00277			
Intercept	3.655***	3.935***						
rho			0.953***	0.499***	0.950***	0.272	0.333*	0.903***
lambda						0.944***	0.403**	
No. Obs.	2900	2900	2900	2900	2610	2900	2900	2900
AIC			−20306.4	−20280.6	−18286.9	−20311.4	−20283.5	−20312.8
r2_w			0.269	0.668	0.350	0.0951	0.668	0.579

Note: *** p < 0.01; * p <0.05; * p < 0.1.

and the number of failures respectively. Consequently, we can also write the hazard ratio as:

$$\lambda(t) = \frac{f(t)}{1 - F(t)}.$$

The survivor function *S(t)* is equal to 1 at t_0 and starts decreasing as *t* increases showing the probability of an individual surviving at time t_j. This formula is used to calculate the survival rate in this paper for all variables (*x*) suspected to have high incidence in the timing of retirement.

An extension of this analysis is, of course, considering the effect of all potential variables simultaneously influencing the timing of retirement. In this case, the hazard ratio $\lambda(t)$ is conditioned to the relevant random variables, yielding the well-known Cox's (1972) proportional hazard model where:

$$\lambda(t|x) = \frac{f(t|x)}{1 - F(t|x)}, \quad (2)$$

where $x \in \mathbf{X}$, which is a set of covariates and holding the curial assumption of $\lambda(t|x) = e^{x\beta} \lambda_0(t)$ and where λ_0 is the baseline hazard.

Following the method proposed above, the analysis provided in this section consists of two parts. First, we perform an exploratory analysis of survival functions by age and different explanatory variables. This provides a univariate analysis of the potential variance a variable would have in explaining the timing of retirement. Second, a Cox's proportional hazard model is estimated to control simultaneously for all the variables affecting the survival timing or hazard. The variables used to explain survival are given in Table 3.

In Figure 2, the survival functions for the different explanatory variables are displayed. The results from the estimations of the survival functions can be summarised as follows. Single persons stay longer at work, compared to belonging to any type of family. Persons belonging to the cohabitant family type are the most likely to retire early. Females tend to stay longer in the labour force and retire later compared to males. Persons occupied in agriculture, forestry or veterinary retire later. Persons active in occupations requiring general training also stay longer in the labour force.

Differences between the other groups are very small. Entrepreneurs owning a limited liability firm tend to retire the latest. Other entrepreneurs also retire late. Commuters tend to retire later compared to non-commuters. There are very small differences between individuals living in urban or rural type municipalities when it comes to the timing of retirement. Individuals that both live and work in urban type municipalities tend to stay longer in the labour market. Individuals living in rural type municipalities and working in rural municipalities stay longer. People living and working in different types of municipalities tend to retire early.

Table 4 shows the results from running Cox's proportional hazard model regressions. The aim is to control for individual factors affecting retirement decisions simultaneously. Also, we include the variables included in our regional models. We do this to control for the potential effect on individuals of regional variation. In including the regional variables, we had to skip two of the ten variables.[3] The estimated coefficients for these turned out extremely large and not interpretable. This was caused by too small variations in the variables and confirmed by the relative standard deviations. We estimate five different models and successively add more variables. The reported parameters are odds ratios, which means that a parameter larger than 1 should be interpreted as increasing the hazard probability for the variable in question. A higher estimate means a higher hazard of leaving employment to retire.

Results reported in Table 4 indicate that women have a seem to be slightly more prone to retire than males. This is a different result compared with the single variable survival functions. Looking at type of family gives us that single mothers and singles have lower hazard rates, which is in line with results from the figure above – they tend to retire later. Looking at the groups for different occupations, occupation in humanities and arts, services and agriculture have lower hazards and tend to retire later. If we go on to the levels and lengths of education, we observe that only doctors seem to stay longer in the workforce compared to the lowest educational level. Interestingly, there seem to be

Table 3. *Explanation of individual level variables used in survival analysis.*

Variable	Explanation*
Family type	1. Husband-Wife Family (54.2), 2. Cohabitant Family (3.3), 3. Single Father (1.2), 4. Single Mother (2.9), 5. Single (38.4)
Gender	1. Male (47.3), 2. Female (52.7)
Occupational group	1. General training (28.0), 2. Education and teacher training (5.5), 3. Humanities and arts (13.6), 4. Science, Mathematics, Computer (1.1), 5. Technology and manufacturing (14.2), 6. Agriculture, Forestry and Veterinary (1.3), 7. Health and Social Care (11.0), 8. Services (4.8)
Education level	1. Elementary < 9 years (27.3), 2. Elementary = 9 years (9.5), 3. Secondary <= 2 years (28.8), 4. Secondary = 3 years (10.6), 5. Post-secondary < 3 years (10.2), 6. Post-secondary => 3 years (12.6), 7. Doctorate (1.0)
Professional status	1. Sailors (0.1), 2. Employees (39.4), 3. Entrepreneurs (4.7), 4. Entrepreneurs own AB (AB = limited liability firms) (2.0)
Commuter	Individuals that live in one municipality and work in another are labelled commuters. That is commuters are those that cross a municipality border on their way to work. Commuters, Yes (33.1), No (66.9)
Municipality type	1. Urban (60.3), 2. Rural (39.7)
Live-work type of municipalities	1. Lives Urban - Works Urban (58.9), 2. Lives Urban - Works Rural (2.4), 3. Lives Rural - Works Urban (6.1), 4. Lives Rural - Works Rural (32.6)

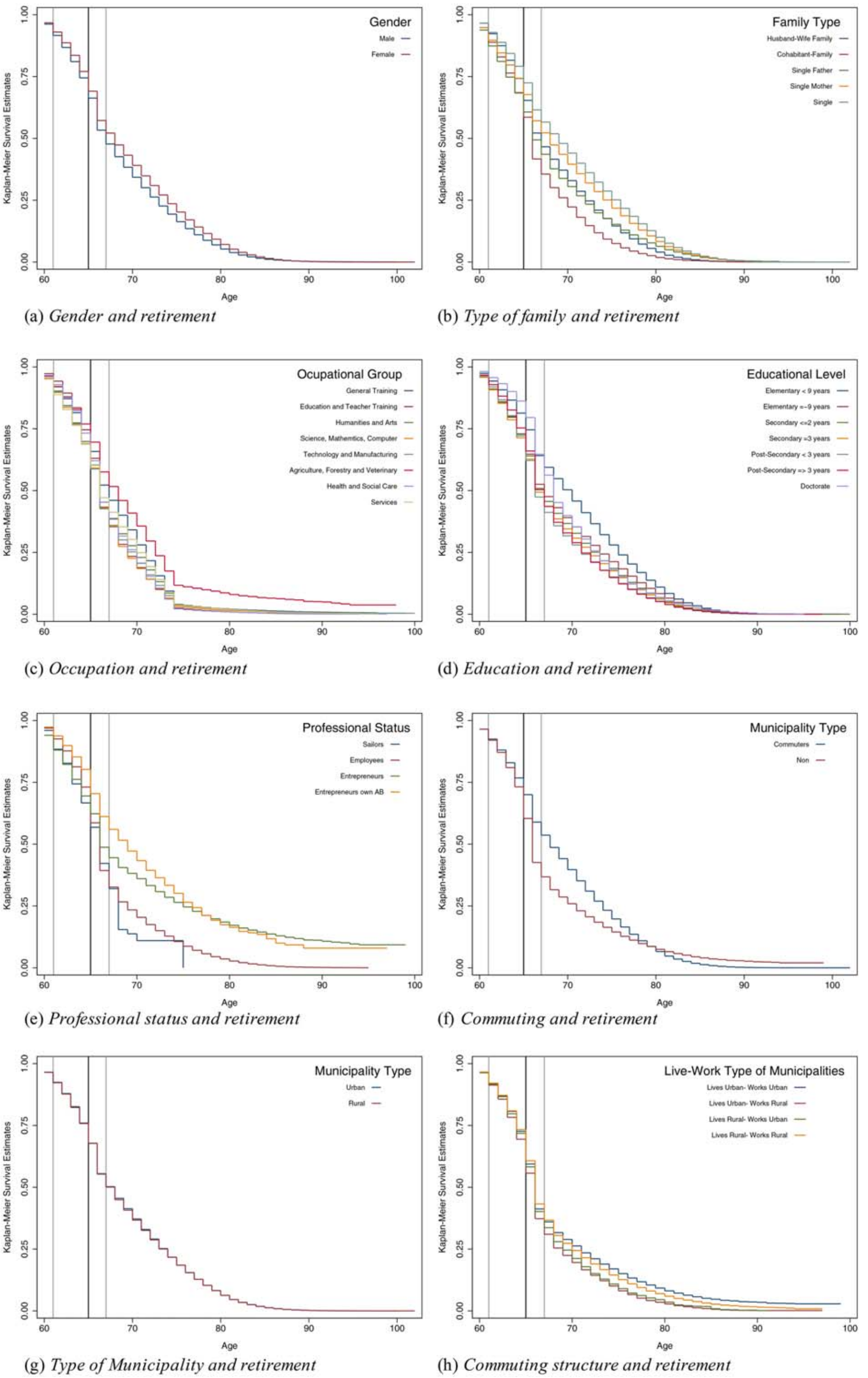
Note: *Numbers in parenthesis refer to percentage shares of the population belonging to each category.

a sort of inverse U-shaped relationship between retirement risk and education. Retirement is less likely for very low and very high levels of education. Employees tend to retire earlier than entrepreneurs. A high income is related to a higher retirement age. This is an expected outcome that is in line with the predictions from the theoretical model. Commuters (crossing a municipal border) tend to stay longer in work. However, the direction of the commute does not seem to matter.

What about the regional variables in the individual survival model? Previously insignificant results from the regional model now appear to have a significant relationship with the timing of retirement, once the individual characteristics are held constant. People in larger regions tend to retire later. Again, there are a lot of things that correlate with regional size that makes these places attractive. For example, labour market matching is arguably better in larger local labour markets, which may lead to later retirement. Higher house prices correlate positively with a lower risk of retirement. Such relationship may be a signal for wealth effect, as previously discussed conceptually. The share of small firms correlates with a higher retirement age in the individual model. This is opposite to the result in the regional model. The local tax rate is significantly related to lower retirement ages in both the regional and individual models. Higher share of blue-collar workers in a region is related to a lower retirement age. A high average wage is correlated to postponing retirement. A high commuting intensity is related to a high retirement age. Individuals tend to retire later in regions with many highly-educated people in the workforce. This corroborates the applicable result we find in the regional model analysis.

CONCLUSIONS

This paper is aimed at analysing statistical evidence for factors that influence the timing of retirement. The background and broad motivation for this paper is to inform the ongoing discussion in Sweden, as well as in many other countries, about the effects of an ageing population on a nation's economic growth, healthcare and pension systems, and other social repercussions. We perform two separate analyses. First, we use regional level



(a) *Gender and retirement*
(b) *Type of family and retirement*
(c) *Occupation and retirement*
(d) *Education and retirement*
(e) *Professional status and retirement*
(f) *Commuting and retirement*
(g) *Type of Municipality and retirement*
(h) *Commuting structure and retirement*

Figure 2. *The survival functions for the different explanatory variables. [Colour figure can be viewed at wileyonlinelibrary.com]*

Table 4. *Individual attributes and timing of retirement: Cox's hazard model estimates.*

		Model 1	Model 2	Model 3	Model 4	Model 5
Sex	Male+	1	1	1		1
	Female	1.036***	1.040***	1.049***	1.050***	1.108***
Family type	Husband-Wife Family+	1	1	1	1	1
	Cohabitant-Family	1.401***	1.371***	1.405***	1.404***	1.219***
	Single Father	1.042**	1.045***	1.063***	1.063***	1.158***
	Single Mother	0.910***	0.909***	0.914***	0.914***	0.979
	Single	0.817***	0.822***	0.826***	0.826***	0.924***
Occupation group	General Training+	1	1	1	1	1
	Education and Teacher	1.034***	0.998	0.980***	0.982**	0.828***
	Humanities and Arts	0.998	0.973***	0.964***	0.964***	0.870***
	Science, Math., Computer	1.305***	1.266***	1.297***	1.295***	1.080***
	Technology and Manufact.	1.062***	1.042***	1.062***	1.061***	0.950***
	Agr., Forestry and Vet.	0.652***	0.655***	0.657***	0.658***	0.617***
	Health and Social Care	1.043***	1.005	0.995	0.995	0.810***
	Services	0.935***	0.927***	0.925***	0.925***	0.874***
	Unknown	0.0767***	0.0698***	0.0762***	0.0762***	0.174***
Education level	Elementary < 9 years+	1	1	1	1	1
	Elementary =~9 years	1.225***	1.211***	1.194***	1.193***	1.247***
	Secondary <=2 years	1.276***	1.277***	1.250***	1.251***	1.420***
	Secondary =3 years	1.272***	1.264***	1.235***	1.235***	1.352***
	Post-Secondary < 3 years	1.345***	1.318***	1.287***	1.287***	1.419***
	Post-Secondary => 3 years	1.243***	1.208***	1.183***	1.181***	1.287***
	Doctorate => 3 years	0.934***	0.868***	0.851***	0.847***	0.904***

Table 4: *Continued*

		Model 1	Model 2	Model 3	Model 4	Model 5
Professional Status	No Function+		1	1	1	1
	Sailors		2.751***	3.259***	3.267***	1
	Employees		1.905***	1.713***	1.826***	1.140***
	Entrepreneurs		1.102***	1.068***	1.164***	1.031**
	Entrepreneurs own AB		1.370***	1.409***	1.518***	1
Income	Low+			1	1	1
	High			0.538***	0.537***	0.759***
Commute	No+				1	1
	Yes				0.916***	0.894***
Commuting direction	Live Rural- Work Urban+					1
	Live Rural- Work Rural					1.019*
	Live Urban- Work Rural					1.002
	Live Urban- Work Urban					1.037
Observed Regional controls	Population (ln)	0.00256***	0.00567***	0.0985***	0.0958***	0.00756***
	House price (ln)	2.091***	1.737***	0.949**	0.945***	4.262***
	Share small firms	5.11e-10***	6.58e-10***	0.00000527***	0.00000546***	1.07e-13***
	Local tax rate (%)	1.480***	1.383***	1.184***	1.182***	1.299***
	Share blue collar jobs	33.24***	27.31***	5.229***	5.353***	21.01***
	Average wage (ln)	0.131***	0.140***	0.179***	0.178***	0.204***
	Intensity of Commuting	0.107***	0.106***	0.228***	0.225***	0.120***
	Education of workforce	0.00135***	0.0000402***	0.0000134***	0.0000148***	1.78e-11***

Notes: Hazard ratios, Failure indicator: Retired = 1; n = 4,190,298; + = Baseline category; ***p < 0.01; *p <0.05; *p < 0.1.
All models are stratified by region to control for unobserved regional variation.
Robust standard errors.

data for Sweden to reveal statistical regularities correlating with the average retirement age in 290 Swedish municipalities (regions). Later in the second step, we use micro data for individuals to model how several covariates influence the risk of retirement over time. We use a utility-maximisation framework to introduce the main explanatory variables. From the mathematical model we derive that the optimal timing of retirement is earlier for higher disutility of work and higher wealth holdings, and it is later for higher longevity and higher for higher income.

In the empirics of this paper, we focus on the choices that individuals make in the Swedish context regarding the timing of retirement. In Sweden, it is possible to retire at the age of 61, with reduced benefits. Full benefits are available from the age of 65. Also, regulations in the labour market stipulate that no one can be forced into retirement before the age of 67. Such information allows us to identify individual retirees in the population. In the regional level analysis, we explain average age at retirement with a number of variables: regional population size, housing prices of single family homes, the share of the working age population that have a job, share of small firms, local income tax rate. These variables, in different ways, measure the condition of the local labour market, incomes and potential wealth. We hypothesise that all these variables potentially influence the choice of an individual's timing of retirement. Results show that people tend to retire later in larger regions. They retire earlier where the local labour market is good. People tend to retire earlier in regions where the share of small firms is higher. A higher local tax rate is associated with earlier retirement. People tend to retire earlier where education levels are higher.

In the individual level analysis, we use information on retirement age. The individual characteristics we observe are occupation, family type, sex, age, education, region of residence, and region of work. The investigation on the individual level is based on survival analysis and Cox proportional hazard estimations. In broad strokes, we find a large gender difference in that women tend to retire earlier than men. Both education and occupation influence the timing of retirement. For education, both educational orientation and length of education are important. We find that retirement is less likely for very low and very high levels of education. One of the most striking differences is the one between employees and entrepreneurs. Entrepreneurs tend to stay active much later in life compared to employed individuals.

One potentially useful extension of this kind of study would be to analyse how the timing of retirement is influenced by what occurs after retirement. For instance, some retirees move permanently to a summer home or to a warmer climate, which may lead to early retirement age. While our study is silent about the potential effects of later life mobility, we acknowledge it as a potentially important factor to be investigated in future studies.

As concerns policy conclusions and implications one can make some observations. Many of the variables are amenable to policy interventions. Perhaps one should think about them first as influencing retirement only indirectly, but that this should be counted in when an overall evaluation is being made. So, the urbanisation process (the relative size of regions), real estate prices (governed to a large part by interest rates), entrepreneurship promotion, changing of tax rates and education levels all influence retirement timing. Policies addressing any of these variables should take the possible effects on retirement into account. The interpretations of our results in a policy-framework should be cautious until more results are presented.

Notes

1. The 17 countries are: Australia, Austria, Finland, France, Germany, Hungary, Italy, Japan, Korea, Mexico, Netherlands, New Zealand, Poland, Slovakia, Sweden, Turkey, United Kingdom.
2. During the period 2001–2011, Sweden's population grew roughly by 6 per cent.
3. Excluded variables: share of women in work force and share of employed.

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